

Claims

1. A method for packing a chromatographic column comprising loading the column with a packing material and essentially eliminating the friction between the packing material and the inner wall of the chromatographic column.

5 2. The method of claim 1 wherein the elimination of friction is by vibrating the column in a direction substantially parallel to its long axis.

3. The method of claim 1 wherein the packing material is loaded into the column in the form of a slurry.

10 4. The method of claim 2 wherein the packing material is loaded into the column in the form of a slurry.

5. The method of claim 4 which further comprises axially compressing the packing material within the column.

6. The method of claim 5 wherein the vibration and the axial compression are performed together.

15 7. The method of claim 5 wherein the vibration is continued until a compacted bed of packing material is obtained.

8. The method of claim 5 wherein the vibration is started before compression of the bed of packing material is applied.

9. The method of claim 2 wherein the packing material is not axially compressed.

10. The method of claim 4 which further comprises percolating one or more column volumes of a packing solvent.

11. The method of claim 10 wherein the column is vibrated during the percolation of the packing solvent.

12. The method of claim 11 wherein the vibration of the column starts before the percolation of the packing solvent.

13. The method of claim 2 wherein the frequency of vibration of the column is between 1 and 1000 hertz.

14. The method of claim 13 wherein the frequency of vibration is between 60 and 120 hertz.

15. The method of claim 14 wherein the frequency of vibration is between 90 and 100 hertz.

16. The method of claim 1 wherein the packing material is loaded into the column as a dry mass of packing material.

17. The method of claim 16 wherein, after the dry packing material is loaded into the column, the packing material is wetted to obtain a slurry of packing material.

5 18. The method of claim 2 wherein the packing material is loaded into the column as a dry mass of packing material.

19. The method of claim 18 wherein, after the dry packing material is loaded into the column, the packing material is wetted to obtain a slurry of packing material.

10 20. A method for reducing friction between the interior surface of a chromatographic column and a bed of packing material contained within the column comprising vibrating the column in a direction substantially parallel to its length.

21. The method of claim 20 wherein the frequency of vibration of the column is between 1 and 1000 hertz.

15 22. The method of claim 21 wherein the frequency of vibration is between 60 and 120 hertz.

23. The method of claim 22 wherein the frequency of vibration is between 90 and 100 hertz.

24. The method of claim 20 wherein the vibration is during the process of packing the chromatographic column.

5 25. The method of claim 20 wherein the packing material is in the form of a slurry.

26. A packed chromatographic column in which the reduced HETP of the column is less than 2.

27. A packed chromatographic column containing a bed of packing material that is substantially radially homogenous.

10 28. A chromatographic column that has been packed according to the method of claim 2.

29. A chromatographic column that has been packed according to the method of claim 3.

15 13. 30. A chromatographic column that has been packed according to the method of claim

31. A method for separating one or more compounds from a mixture of compounds comprising inserting the mixture into one end of a chromatographic column that has been packed while being vibrated in a direction substantially parallel to its long axis and permitting the compounds to travel along the length of the column and exit at the opposite end of the column.

5 32. An apparatus for vibrating a chromatographic column comprising a holder for the chromatographic column and a vibrator that vertically oscillates the column, wherein the holder maintains the column in a substantially vertical direction during the oscillation.

10 33. The apparatus of claim 32 wherein the holder comprises a base and one or more horizontally extending support arms connected to the base for maintaining the column in a desired position.

34. The apparatus of claim 32 wherein the vibrator is a vibrating table upon which the holder is anchored.

35. The apparatus of claim 32 wherein the vibrator is an integral portion of the holder.